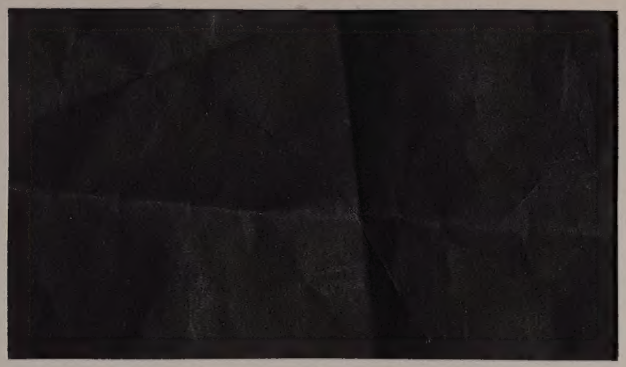
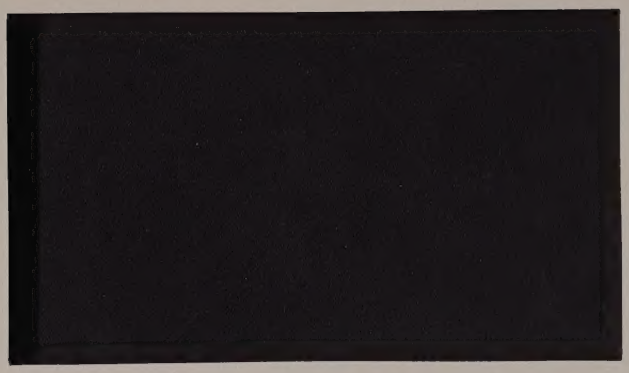
BARBER COLMAN



INSTRUCTION MANUAL

MP MASTER
MA32085

BARBER-COLMAN COMPANY
Industrial Instruments Div. • Rockford, Ill., U.S.A.



IN 1240-3

Model 151L or Model 151R

LIMITROL

INTRODUCTION

This instruction manual is designed to help you secure maximum benefits from your new Limitrol. It should be given to persons responsible for installation, operation and maintenance of this instrument.

All instructions in this manual are applicable to either the Model 151L or 151R unless otherwise noted.

Your Barber-Colman factory trained field engineer is always available for further help in the solution of your control problems. Offices are located in all principal cities.

BARBER-COLMAN COMPANY
Industrial Instruments Division

Litho in U.S.A.

F-12710 - December 1964

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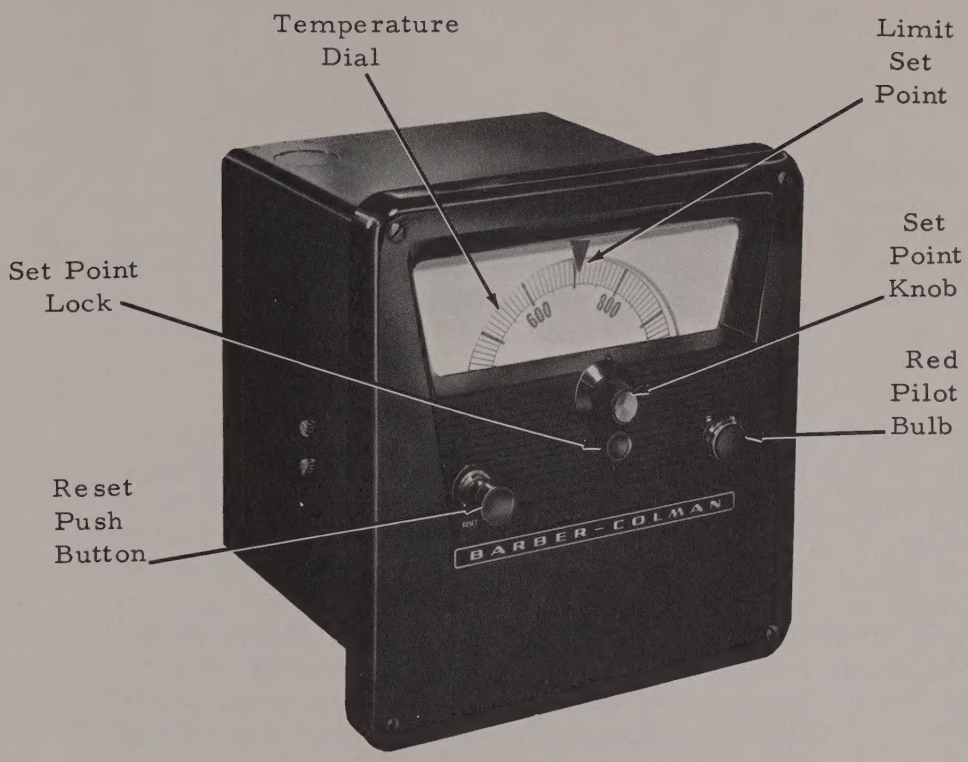


Model 151L or 151R Limitrol

SPECIFICATIONS

Switch Action	Two-position SPDT	Sensitivity	75 microvolts for all scale spans
Contact Rating	Non-inductive loads. 6 amperes at 120 volts a-c 3 amperes at 240 volts a-c	Power Supply	120 or 240 volts 60 cycle a-c
Scale Length	7 1/4 inches	Dimensions	7 5/8" wide x 7 25/32" deep x 8 1/8" high
Accuracy of Dial Setting	1% of scale range	Net Weight	Approximately 7 pounds

MATERIAL WARRANTY

All equipment except tubes, photocells, and thermocouples, which within one year from date of shipment is found to have been originally defective, will be repaired (replaced if necessary) free of charge, if returned immediately, prepaid, to the factory at Rockford, Illinois. The seller shall not be liable to the purchaser, or to any other person, firm or corporation for any direct, indirect or consequential damages or injury of any kind or character; that by acceptance of such equipment the purchaser shall accept and assume all liability for any and all damages or injuries that may result from the use or misuse of such equipment by the purchaser, or by any other person, firm or corporation; and that there shall be no other warranty whatever, expressed or implied, with respect to such equipment.

DESCRIPTION

General Description and Applications

The Barber-Colman Model 151L Limitrol is used to provide insurance against human or instrument failures which may permit overshooting of critical temperatures. Its use as an indicating safety instrument prevents temperatures from rising above the danger point of the equipment or process material. The Model 151R is identical to the Model 151L except it is designed to give protection to low temperature conditions.

Either model will automatically shut off the fuel supply at any specified temperature manually set on the indicating scale and, if so desired, sound alarm. When used in combination with controllers and recorders, they give added protection to the entire control system.

Whenever the setpoint limit is exceeded, the instrument goes to the "off" position, the red signal will come on and the "off" portion of the control circuit may actuate the appropriate alarm apparatus. The Limitrol will stay in this "off" condition until the control temperature (or other variable) is again within limits and the manual reset button is pushed to actuate the instrument relay. The setpoint lock mechanism prevents accidental setpoint change.

Description of Electronic Circuit

The output of the thermocouple is applied across a known resistance in the bridge circuit. Any difference in the potential of the two millivoltages is amplified by means of a saturable core reactor to control the firing of a thyratron and actuate the instrument relay. An open or break in the thermocouple circuit causes the instrument to remain in the off position regardless of temperature setting.

Control Circuit

The control circuit in the instrument consists of an SPDT switch brought to terminals marked H-C-L which indicate high, common and low. Contacts C to L is made when the temperature is below control point and C to H is made when temperature is above control point. Contact rating is 6 amperes at 120 volts or 3 amperes at 240 volts, non-inductive load.

INSTALLATION

Unpacking the Instrument

This instrument and its associated equipment has been carefully manufactured and packed at the factory. Remove the instrument and accessories from the packing box and check items against the packing slip. If the equipment is found to be damaged in transit, report extent of damage to the carrier immediately. Repack in original packing box until ready for installation.

CAUTION: Handle with care.
Safeguard instrument from shock.
Avoid oil accumulation.
Keep instrument temperature under 130°F

Mounting Instructions

Locate the instrument to avoid shock, dirt, moisture and temperatures over 125°F. Provide suitable shelter to avoid moisture and temperature extremes if installed outdoors. For panel or flush mounting, provide an opening 6 7/8" wide by 7 3/8" high.

For wall or surface mounting, remove chassis and secure housing to surface. See mounting dimensions on next page.

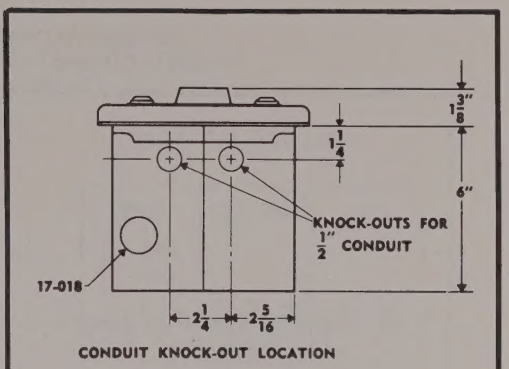
Wiring

Run all wires in pipe, conduit or Greenfield (BX) in accordance with local electrical code. Run thermocouple extension leadwire in separate conduit. Several thermocouple wires may be run in the same conduit.

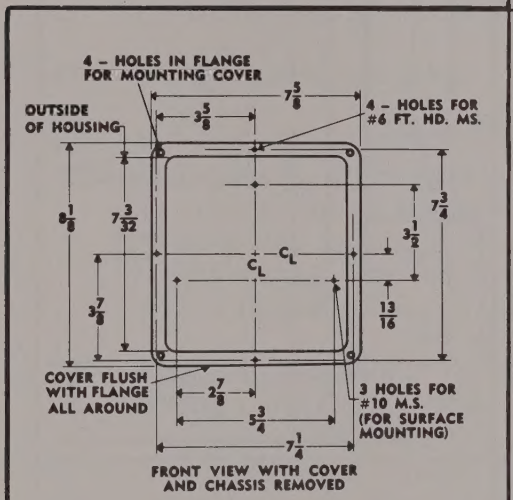
Line connections are for 120 or 240 volt, 60 cycle operation only.

Use only extension leadwire correct for the type of thermocouple (TC) as specified on the scale. The most commonly used types are: Iron-Constantan (Type J), Chromel-Alumel (Type K), and Pt 87%-Rh 13% Pt 100% (Type R). Ordinary copper wire will not serve the purpose.

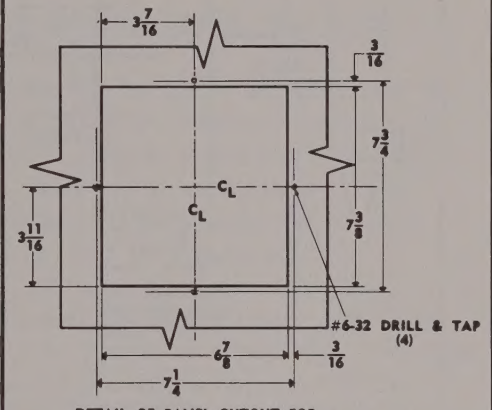
MOUNTING DIMENSIONS
Model 151L
or
Model 151R



CONDUIT KNOCK-OUT LOCATION



FRONT VIEW WITH COVER AND CHASSIS REMOVED



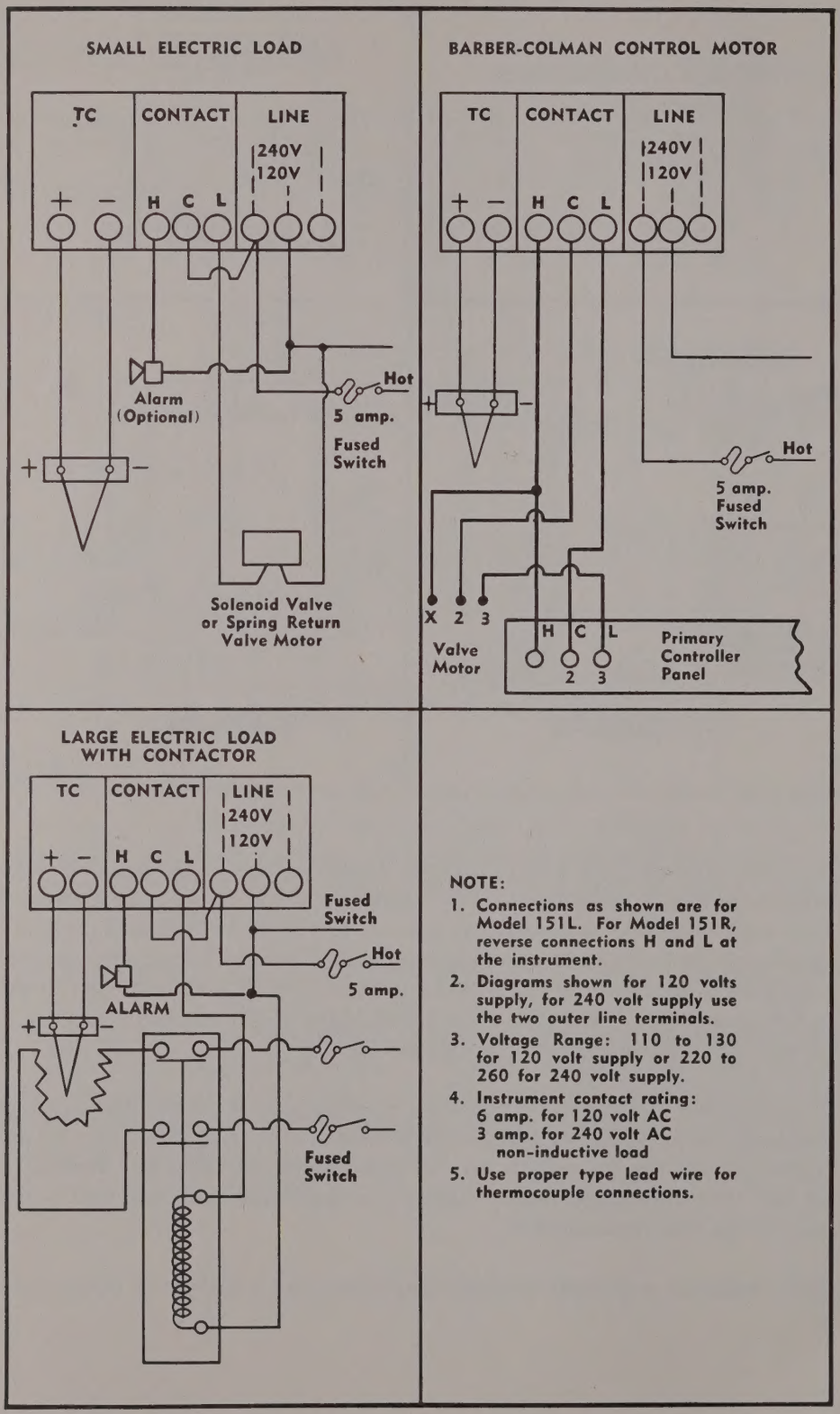
DETAIL OF PANEL CUTOUT FOR FLUSH MOUNTING

Proper polarity (+) and (-) of the leadwire must be observed to obtain correct readings. The negative wire is usually coded red. Correct polarity of leadwire can be checked by connecting the leadwire to the thermocouple terminals and twisting the free ends together. Set the control dial to about 200°F and with the instrument powered, the red control indicator light should switch on when the leadwire junction is heated.

Connect the leadwire to the thermocouple. With the thermocouple heated, and the reset button depressed, the red control indicator light should again switch on. If not, reverse only the connections at the thermocouple head, since the leadwire was correctly connected at the instrument.

See sheet on external wiring diagrams for additional information.

EXTERNAL WIRING DIAGRAMS
BARBER-COLMAN MODELS 151L AND 151R



NOTE:

1. Connections as shown are for Model 151L. For Model 151R, reverse connections H and L at the instrument.
2. Diagrams shown for 120 volts supply, for 240 volt supply use the two outer line terminals.
3. Voltage Range: 110 to 130 for 120 volt supply or 220 to 260 for 240 volt supply.
4. Instrument contact rating:
   6 amp. for 120 volt AC
   3 amp. for 240 volt AC
   non-inductive load
5. Use proper type lead wire for thermocouple connections.

OPERATION

Operation of Model 151L

a. Turn on power to instrument.

b. Loosen setpoint lock mechanism and adjust setpoint at desired value. Tighten lock.

c. Normal operation occurs after a brief warm-up period.

d. Push reset button located to the left of the pilot light.

e. Below limit setpoint, instrument is "on", and heating is maintained. Pilot light will be off. Contact C to L will be made until the temperature reaches the limit setpoint. At setpoint, contact C to L will break and contact C to H will make. The instrument will then operate to turn off the heat and the red pilot light will turn on.

To find the temperature at the thermocouple at any given time, turn the dial slowly until the point is found at which the red pilot lamp turns on and read the temperature at the control index. To restore operation depress reset button. Relay will be powered and light will go off when temperature is below limit setpoint. Set instrument at proper limit setpoint and tighten lock.

Operation of Model 151R

Operation of the Model 151R is identical to the 151L except that it operates as a low limit cutout. The red pilot light turns on when the process temperature falls below the limit setpoint and the temperature must be above setpoint before the instrument can be reset.

MAINTENANCE

Routine Servicing

Do not oil or grease any part of the instrument at any time.

Inspect all terminal connections regularly, both thermocouple and control circuits.

Check thermocouple for deteriorated hot junctions. Replace if questionable.

Be sure the leadwire and the thermocouple polarity are correct and the wires are not damp or grounded. Only the hot junction of the thermocouple may be grounded.

Replace the electronic tube if control fails to operate.

Do not handle the instrument or apply force to the scale plate or shaft as the slidewire potentiometer may be damaged.

If the instrument stays in the off position, check for a break in the thermocouple circuit.

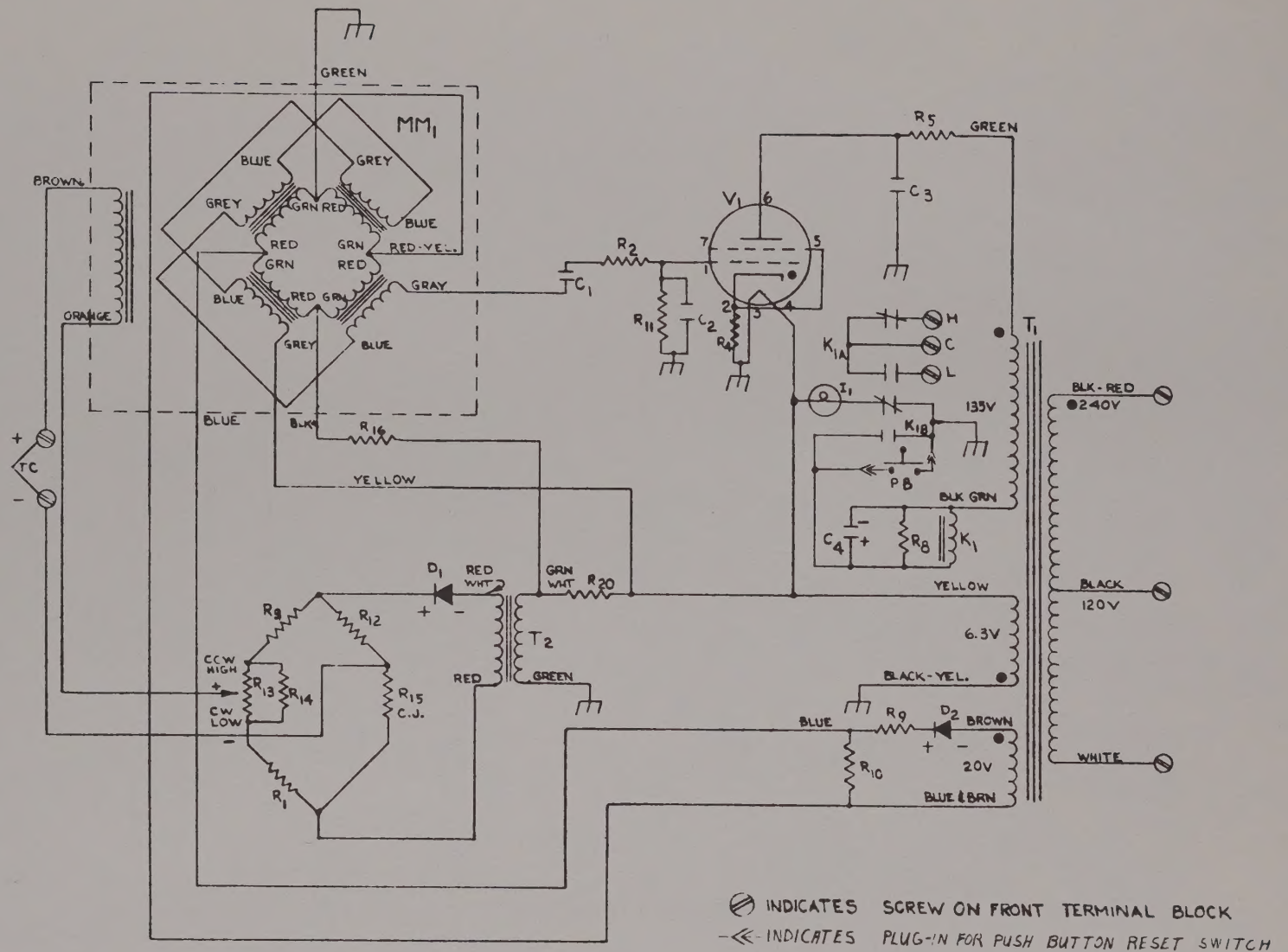
Be sure the corresponding line voltage is connected to the correct terminals.

It is recommended that the instrument housing be grounded.

Use burnishing tool or equivalent if necessary to clean contacts of the instrument relay.

The following spare parts are recommended:

Replacement Tube (2D21)	Part Number 31-018
Pilot Lamp (#51)	Part Number 36-022
Replacement Thermocouple	



WIRING SCHEMATIC

Model 151L shown. Model 151R is the same except connections of transformer are reversed.

REPLACEMENT PARTS

Item	Part Number	Description
C1	39-100	Capacitor .002 MF 600 v d-c ± 10%
C2	39-076	Capacitor 250 MMF 500 v d-c ± 20%
C3	39-103	Capacitor .01 MFD GMV 1000 v d-c
C4	CYZR-327-1	Capacitor 8 MFD 250 v d-c -10% +100%
D1	37-030	Silicon Diode
D2	37-030	Silicon Diode
I1	36-022-1	Pilot Bulb #1908 7 volt .190 amps
K1	38-143	Relay
MM1	A-3449	Modulator
PB	32-082	Push Button Switch N.O.
R1	A-4409	Low Cal. Resistor
R2	CYZR-170-14	.68 megohm 1/2 w ± 10%
R3	A-4409	High Cal. Resistor
R4	40-264	100 ohm 2 w ± 10%
R5	40-229	450 ohm 3 w ± 10%
R6	40-099	68 ohm 1 w ± 10%
R8	40-104	5.6 k 1 w ± 10%
R9	CYZR-170-36	680 ohm 1/2 w ± 10%
R10	CYZR-170-31	33 ohm 1/2 w ± 10%
R11	40-089	8.2 megohm 1/2 w ± 10%
R12	40-098	330 ohm 2 w ± 3%
R13	29-054-100	15 ohm 2 w ± 10% Potentiometer
R14	40-119	Shunt Resistor (see note)
R15	See Table I	Cold Junction Resistor
R16	40-014	150 ohm 1/2 w ± 10%
R20	40-102	20 ohm 5 w ± 10%
T1	30-076	Transformer
T2	A-3443	Ref. Reactor
V1	31-018	Tube (2D21)

TABLE I

TC	R15
I/C	40-134
C/A	40-135
Plt	40-136

NOTE:
For range spans above 20 mv R14 is 15 ohm 40-119.
For range spans below 20 mv R14 is 5 ohm 40-132.

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MA32085

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